Comment on "Patent Grant Rates at the United States Patent and Trademark Office"

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By

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Abstract.

In recent patent reform proposals made by the Federal Trade Commission [FTC] and the National Academy of Sciences [NAS], there has been discussion that the United States Patent and Trademark Office [USPTO] might have a high grant rate of patents compared to rates of other industrialized countries, including Japan and European countries. This discussion began with papers of Quillen and Webster that suggested that the grant rate might be as high as 97% and more reasonably is at least 85%. Clarke suggested that the issue rate is closer to 75%. While Quillen and Webster based grant rate on applications "allowed," Clarke based his studies on applications "issued." In this paper, we use data from the USPTO to show that the difference between "allowed" and "issued" applications is not the reason for the divergence in grant rates. Instead, we suggest that Quillen and Webster's elevated grant rates arise from a flawed numerical approach.

INTRODUCTION

Discussions of inappropriately high patent grant rates at the USPTO have attracted recent interest.[1] In an earlier article in this journal[2], we compared the Quillen and Webster ("QW model")[3] for calculating patent grant rate with Clarke's model[4] and we

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[1] John R. Thomas wrote: "Global patent administration is strained to the breaking point. Domestic commentators have persistently suggested that the U.S. Patent and Trademark Office ("USPTO") has become more lenient, allowing an increasing number of patents to issue which appropriate knowledge previously within public domain. This impression recently received a quantitative boost from Cecil D. Quillen, Jr. and Ogden H. Webster, whose data analysis leads them to conclude that the USPTO may approve as many as 97% of the applications placed before it." 17 Berkeley Tech. L.J. 727 (2002). A current website perpetuates the 97% number: "If a rigorous system is undesirable, the authors argue, the present grant rate of 97 percent may be appropriate, but in this case, the PTO should admit that it issues a patent 'for virtually every original application.'"
http://www.researchoninnovation.org/tiip/archive/2003_1_b.htm
Scott R. Boalick in Patent Quality and the Dedication Rule, 11 J. Intell. Prop. L. 215 (2004), mentions the infamous peanut butter and jelly patent (U.S. 6,004,596) and the swing patent (U.S. 6,368,227), although such episodic evidence does not, by itself, provide evidence of a systematic enhancement in grant rate.
[2] Lawrence B. Ebert, .Patent Grant Rates at the United States Patent and Trademark Office, 4 CHI-K. J. INTELL. PROP. 108 (2004); available http://jip.kentlaw.edu/art/volume%204/4-1-4.htm).
[3] Cecil D. Quillen and Ogden D. Webster, Continuing Patent Applications and Performance at the U. S. Patent and Trademark Office, 11 Fed. Cir. B. J. 1 (2001-2002) [hereafter QWI]; Cecil D. Quillen and Ogden D. Webster, and Richard Eichman, Continuing Patent Applications and Performance at the U. S. Patent and Trademark Office-Extended, 12 Fed. Cir. B. J. 35 (2002). [hereafter QWII].
[4] Robert A. Clarke, U.S. Continuity Law and its Impact on the Comparative Patenting Rates of the U.S., Japan, and European Patent Office, 85 J. Pat. & Trademark Off. Soc'y [JPTOS] 335 (2003). Clarke also

noted a preference for Clarke's model. One discrepancy between the two models was that the QW model focussed on allowed patent applications, while Clarke studied patent applications that were allowed and issued. Because one may withdraw allowed patent applications before issuance, the QW model can give higher rates than Clarke's model by counting withdrawn allowed applications as granted that the Clarke model does not count as issued. Data obtained from the USPTO show that this divergence between models does not account for the reported difference in grant rates. Instead, the QW model, by adjusting the grant rate expression for continuing applications that do not arise from any previous abandonment, incorrectly and artificially enhances the grant rate. This is the major cause of the difference between the two models. Furthermore, we reiterate our previous conclusion that the QW model wrongly assumes that divisional and continuation-in-part applications reflect repeated attempts to claim material of the parent application. As re-enforced by the recent Federal Circuit decision in Innova/Pure Water v. Safari Water,[5] the claims (not the specification) define the invention; efforts to obtain the claims of divisionals and continuations-in-part do not represent a repeat of efforts in the parent application. For this reason, the model of Quillen and Webster is flawed for correcting the patent grant rate expression for divisional and continuation-in-part applications, which do not reflect repeated efforts to obtain earlier claims.

DISCUSSION

I.   Issue of Allowed Application vs. Issued Application

As noted in our previous article, there was some divergence in the raw data for applications filed and applications allowed between the papers of Quillen/Webster and Clarke. This divergence was insufficient to account for a divergence in grant rate between 85% ("adjusted corrected" rate in QWII) and 74% (Clarke). It has also been suggested that the divergence in grant rate arises from a difference in use of "allowed" applications (Quillen/Webster) and "issued" applications (Clarke).[6]

To help understand the magnitude of the difference between the "allowed application" vs. "issued application" difference in the period relevant to the papers of QW and Clarke, the USPTO provided the following data.

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questions the appropriateness of comparing grant rates in foreign countries to those in the United States, because of the existence of different rules.
[5] 381 F.3d 1111 (Fed. Cir. 2004), 2004 U.S. App. LEXIS 16549.
[6] The suggestion has been made by Cecil Quillen. See also Shapiro: Turning to patent approval rates, or the percentage of patent applications that ultimately result in patents, the FTC and NAS differ as to how to properly measure these rates. According to the FTC Report, one witness calculated the USPTO's grant rate at 98% in 2000, compared with 67% in Europe and 64% in Japan. However, a USPTO witness criticized these calculations and stated that, properly measured, the USPTO grant rate was about 75%. The NAS cites a study by Quillen and Webster finding that, after certain corrections are made, "the USPTO eventually issued patents on between 85 percent and 97 percent of the applications filed between 1993 and 1998 - 20 to 30 percent higher than official estimates, which have ranged between 60 percent and 70 percent for 20 years." 19 Berkeley Tech. L.J. 1017, 1030 (2004).

Year	Applications Allowed	Patents
1996	121,513	117,259
1997	136,137	131,465
1998	143,843	140,748
1999	155,269	151,992
2000	166,110	162,735

Although this data may not be equivalent to past data, it is presumably self-consistent as to the distinction between "allowed" vs. "issued" applications. To get an idea of the impact of the "allowed" vs. "issued" distinction on basic grant rate, we will use the applications data of both Quillen/Webster and of Clarke.

Data using application numbers of QW

Year	Applications	Ap. Al.	%Ap. Al.	Patents	%Pat.
1996	181,116	121,513	67	117,259	65
1997	220,773	136,137	62	131,465	60
1998	240,090	143,843	60	140,748	59

Data using application numbers of Clarke

Year	Applications	Ap.Al.	%Ap.Al.	Patents	%Pat.
1996	190,638	121,513	64	117,259	62
1997	218,881	136,137	62	131,465	60
1998	236,173	143,843	61	140,748	60

The difference in basic grant rate percentage between using "allowed" applications and "issued" applications is of the order of 2%.[7] The difference does not account for the difference in the numbers of 85% (corrected grant rate of Quillen/Webster) and 74% of Clarke.

An applicant can withdraw an allowed application before or after payment of the issue fee. To help understand the relative magnitude of each, the USPTO provided the following data.

Year(CY)	Applications Allowed	Withdrawn before issue fee	Withdrawn after issue fee
2002	183,760	10,856	2,545
2003	187,890	10,077	2,766

Withdrawal of an allowed application after payment of the issue fee typically occurs when new art is uncovered. Additionally, an inventor may withdraw an allowed application before payment of the issue fee simply because the inventor no longer thinks the invention is a viable economic idea. It is unlikely that an applicant would withdraw

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[7] The difference in grant rate for "allowed" vs. "issued" numbers (2%) is of the same order of magnitude as the variations in numbers used by Quillen/Webster and Clarke for patent applications.

an application to obtain broader claims. Rather, the applicant would allow the first application to issue and would file a continuation to obtain the broader claims. Obviousness-type double patenting issues might arise, but would not be significant, because these would not alter the lifetime of a patent issuing on the broader claims (the lifetime would be 20 years from the earliest priority application). Novelty (statutory)-type is not an issue. If the claims in a continuation are broader in any respect, then statutory double patenting (35 USC 101) does not apply. MPEP 804 states in pertinent part: "A reliable test for double patenting under 35 USC 101 is whether a claim in the application could be literally infringed without literally infringing a corresponding claim in the patent. In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970). Is there an embodiment of the invention that falls within the scope of one claim, but not the other? If there is such an embodiment, then identical subject matter is not defined by both claims and statutory double patenting would not exist." Thus, there is no reason to withdraw a first application from issue to obtain broader claims.

Let's consider which is the more reasonable choice for determining the patent grant: allowed application or issued application. A major contention in the patent reform debates is that the Patent Office is being too lenient in granting patents. If an allowed application is withdrawn by the applicant, before or after payment of the issue fee, because of newly discovered prior art, it does not make sense to treat the application as "granted" by the Patent Office. The initial decision of the Patent Office was based on incomplete information. It would be wrong to say that the Patent Office was too lenient in its decision when the decision was based on incomplete information and that decision is abrogated, even if by the applicant. We will return to this below.

II. The Basis for Adjustment in QWII

A. The Allison/Lemley data

To fashion an adjustment in the second paper, Quillen, Webster and Eichmann utilized information derived from a set of 1000 issued patents discussed by Allison and Lemley[8]:

   "Using the Allison and Lemley data, we identified 297 patents (of the 1000) that had been granted on continuing applications (i.e., continuations, continuations-in-part, or divisionals) and determined that the USPTO had granted patents on 92 of their parent applications (31%). We also determined that 141 patents had been granted on continuation applications, and that patents had been granted on 19 of the 141 parent applications (13% of the 141, 6.4% of the 297)."[9]

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[8] John R. Allison & Mark A. Lemley, Who's Patenting What? An Empirical Exploration of Patent Prosecution, 53 VAND. L. REV. 2099, 2100 (2000).

[9] QWII, at page 38.

One might infer that the 297 patents which were continuing applications were part of the set of 1000, but that the 92 parent patents were not part of the set of 1000. One might also infer that there were 156 patents (297-141) which were divisionals and continuations-in-part. The probability of a parent patent on a continuation, 13% (=19/141), is significantly lower than a parent patent on a divisional/cip, 47% (=73/156). The text of QWII is silent on patent families with two or more issued continuations, whether or not the parent issued as a patent. The important number for the adjustment in QWII is the 31%, from which the authors inferred that in 69% of the cases (100% - 31%) there was no prior (or in fact other) patent associated with the continuing patent.

B. The creation of an adjusted grant rate

The frequently discussed 85% number for an adjusted corrected Grant Rate derives from the use of the correction factor of 0.69:

"Calculation 3 is the determination of the adjusted Grant Rate taking into account all continuing applications in which a patent was granted on both the parent application and the continuing application (31% of all continuing applications). The adjusted corrected Grant Rate on this assumption is 85%, which is substantially above the Grant Rates reported for the EPO, JPO and USPTO on the Trilateral Website."[10]

Thus, the formula for grant rate ("GR") is expressed in terms of applications allowed ("Al"), applications abandoned ("Ab"), and total continuing applications ("CA") as follows

$$GR = Al/(Al + Ab - F*CA)$$

Wherein F = 1.0 in QWI and F=0.69 in QWII.

The correction factor 0.69 selected in QWII arises from the observation that for 31% of the patents of the 297 patents of the set of 1000, a patent issued on the parent of the continuing application, with the inference that for 69% of the continuing applications the parent was abandoned. The adjustment of QWII, relative to QWI, is to recognize that in 31% of continuing applications, there was no abandonment of the parent, and thus subtracting those continuing applications from total abandonments is wrong, because there is no antecedent abandonment.

C. What is wrong with the creation of the adjusted grant rate[11]

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[10] QWII, at pages 49-50.

[11] There is a separate issue of timing. Grant rate is defined on the Trilateral Website as "the number of applications that were granted during the reporting period, divided by the number of disposals in the reporting period (applications granted plus those abandoned)." If one is in a period of steeply increasing applications between periods, one can have issues because of not being in a steady state relationship between applications filed and applications allowed in a given period. Further, there is an issue of time lag between "allowance" and "issue."

The QW model was designed to correct patent grant rate for a situation in which the patent applicant persistently tried to obtain the same claims. The particular context addressed in QWI is that of an applicant who filed a first application, argued and lost, and then filed a new second application (with the same claims) and abandoned the first application. For example, if one had an initial application, and then filed nine continuing applications, of which only the ninth led to a patent, the QW model would convert a 10% grant rate $(1/(1 +9))$ into a 100% grant rate $(1/(1+9-9))$. Thus, the model might be acceptable when the subtraction of a continuing application effectively cancelled out an antecedent abandonment. The application wasn't really abandoned because a new application took its place. However, the model is not acceptable when there is no antecedent abandonment. By subtracting continuing applications in the denominator of the grant rate expression for situations in which there is no antecedent abandonment, the model artificially and wrongly enhances grant rate.

Although the adjusted grant rate in QWII corrects for some flaws of QWI, it still subtracts continuations in the denominator for which there are no antecedent abandonments, and thus it still artificially and wrongly enhances grant rate.

First, although QWII recognized that it was wrong to subtract continuing applications from abandonments for cases wherein the parent of the continuing application issued as a patent (and thus there was no antecedent abandonment meriting subtraction),[12] QWII did not show that there was a reason to subtract the remaining 69% of continuing applications within the denominator term of the grant rate expression. That is, although a reason was given not to subtract the 31% of the continuing applications in the denominator, there was no affirmative reason given that it was permissible to subtract the remaining 69%.

One case where it is not justified is that wherein there are more than one continuing patent arising from a parent application, whether or not the parent application is abandoned.

Consider the example of U.S. Patent 6,745,010, wherein we have three issued patents on continuations and one issued patent on the parent. Applying either formalism, we have a grant rate in excess of 100%:

GR = (4)/(4 + 0 - 3) = 400% (QWI)

GR = (4)/(4 + 0 -0.69*3) = 207% (QWII)

The problem is the same as the problem already recognized by Quillen, Webster, and Eichmann for the parent patent/one continuing patent case: one should not be subtracting continuing applications when there is no identified antecedent abandonment.

Another case where it is not justified is that wherein the continuing application is a continuation application under the so-called by-pass route in PCT practice. Therein, there is a continuation application filed from a PCT, but there is no antecedent abandonment.

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[12] John R. Allison and Emerson H. Tiller, The Business Method Patent Myth, 18 Berkeley Tech. L.J. 987, at footnote 139 of QWII: "adjusting assumptions from previous study to correct a probable flaw, but still producing an estimated allowance rate much higher than reported, and higher than in Japan and Germany."

Thus, it is invalid to assume that 69% of continuing applications have an antecedent abandonment and it is invalid to subtract the term 0.69 X (continuing applications) in the denominator of the grant rate expression.

Second, recall that the 0.69 factor derives from all continuing applications, including continuations, divisionals, and continuations-in-part. However, divisionals and continuations-in-part, basically by definition, are not repeated attempts to claim the same invention, and thus cannot have an antecedent abandoned case to justify subtraction in the denominator term of the grant rate expression. A divisional application arises from a restriction requirement imposed by the examiner, stating that the claims of the divisional are directed to a different invention than the claims of the parent. Because of the restriction requirement, the claims of the divisional are insulated from obviousness-type double patenting rejections. A continuation-in-part application involves new matter and thus cannot have an antecedent abandoned case.

In this view, at most only 41% of continuing applications (122/297; i.e., only those related to continuations), rather than 69% (205/297; including those related to divisionals and continuations-in-part[13]), should be subtracted in the denominator. Further, of these, continuation applications with no antecedent abandonments should not be considered, for the reasons outlined above.

Further, consider the discussion above about whether to count applications "allowed" vs. applications "issued." Let's assume an applicant files one application, and it is allowed; however, new art is uncovered after allowance, and a continuation, with the new art, is filed, but is rejected over the new art. The contribution to the grant rate under QWI of this sequence is

$$GR = (1)/(1 + 1 - 1) = 100\%$$

One has one allowance, one continuation, and an abandonment of the continuation. Even though the Patent Office rejects the application, and no patent issues, the numerical treatment of QW is to enhance the grant rate.

As a general matter, the approach of Quillen and Webster, in being specification-centric rather than claim-centric, misidentifies the proper focus of analysis. It is the claims which define the invention, not the specification.

As the Federal Circuit recently observed in Innova[14]:

It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude. Aro Mfg. Co. v. Convertible Top Replacement Co., 365 U.S. 336, 339, 5 L. Ed. 2d 592, 81 S. Ct. 599 (1961) ("The claims made in the patent are the sole measure of the grant."); Altoona Publix Theatres, Inc. v. Am. Tri-Ergon Corp., 294 U.S. 477, 487, 79 L. Ed. 1005, 55 S. Ct. 455 (1935) ("Under the statute it is the claims of the patent which define the invention."); Smith v. Snow, 294 U.S. 1, 11, 79 L. Ed. 721, 55 S. Ct. 279 (1935) ("The claims of the patent, not its specifications, measure the invention."); Cont'l Paper Bag Co. v. E. Paper Bag Co., 210

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[13] An example of a situation wherein the claims of the continuation-in-part are not supported by the disclosure of the parent is In re Curtis, 354 F.3d 1347 (Fed. Cir. 2004).
[14] INNOVA/PURE WATER, INC. v. SAFARI WATER FILTRATION SYSTEMS, INC. (doing business as Safari Outdoor Products), 381 F.3d 1111 (Fed. Cir. 2004), 2004 U.S. App. LEXIS 16549 at *10.

U.S. 405, 419, 52 L. Ed. 1122, 28 S. Ct. 748 (1908) ("In making his claim the inventor is at liberty to choose his own form of expression, and while the courts may construe the same in view of the specifications and the state of the art, they may not add to or detract from the claim." (citation omitted)); White v. Dunbar, 119 U.S. 47, 52, 30 L. Ed. 303, 7 S. Ct. 72 (1886) ("The claim is a statutory requirement, prescribed for the very purpose of making the patentee define precisely what his invention is; and it is unjust to the public . . . to construe it in a manner different from the plain import of its terms."); Merrill v. Yeomans, 94 U.S. 568, 570, 24 L. Ed. 235, 1877 Dec. Comm'r Pat. 279 (1876) ("[The statutorily required] distinct and formal claim is, therefore, of primary importance, in the effort to ascertain precisely what it is that is patented to the appellant in this case."); SRI Int'l v. Matsushita Corp. of Am., 775 F.2d 1107, 1121 (Fed. Cir. 1985) (en banc) ("It is the claims that measure the invention.").

In analyzing whether a given patent application is a repeated effort, one must look at the claims, not the specification, of the application. By definition, the specification of a parent application must support claims made in a later divisional or continuation application. That, however, does not mean that the claims of the later divisional or continuation application reflect a repeated effort as to claims of the parent. In issuing a restriction requirement on an application, the USPTO tells the applicant that there are claims directed to different inventions, and the applicant must chose among different groups of claims. Claim groups not initially elected may be prosecuted in later divisional applications, which by definition are directed to different inventions. As to a continuation-in-part (cip) application, an applicant would not file a cip to seek claims disclosed in the parent application, but rather would direct claims to the new matter introduced in the cip.

D. Use of continuations is commonplace

Two of the Nobel Laureates in Chemistry for 2004 are named inventors on patents which arose through continuation applications. Dr. Avram Hershko is a named inventor on U.S. Patent 6,528,633, which application is a divisional of U.S. patent application Ser. No. 08/828,533, filed on Mar. 31, 1997, now U.S. Pat. No. 6,180,379 which is a continuation-in-part of U.S. patent application Ser. No. 08/820,693, filed on Mar. 18, 1997 and abandoned. Dr. Aaron Ciechanover is a named inventor on U.S. Patent 6,656,713, which application was a continuation of Ser. No. 09/210,060 filed Dec. 10, 1998 and abandoned.

Additionally, US Patent 5,130,538, directly to electrospray mass spectrometry and at issue in the dispute between 2002 Nobel Laureate John Fenn and Yale University, was a continuation of an abandoned application.[15]

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[15] Susie Poppick, "Former prof loses ruling over patent," Yale Daily News, Feb. 14, 2005. Available http://www.yaledailynews.com/article.asp?AID=28373. Although the QW model is concerned with repeated attempts through continuing applications, it is underinclusive in ignoring applications filed by

Several of the patents in the recent litigation between Kodak and Sun related to Java involved continuation applications. US 5,226,161 (filed Aug 31, 1992) is a continuation of US 5,206,951 (filed April 3, 1991) and has but one claim, but the later filed US 5,421,012 (filed May 20, 1993), a continuation of US 5,226,161, has 51 claims.

Further, the fate of the earlier-filed parent application may not be determined until after a later child application is allowed and issued. For example, the continuation-in-part application of Caterpillar (US 6,651,618) was issued before the somewhat controversial[16] parent issued (US 6,688,280).

IV.   The footnote in the Boston University Law Review

Mark Lemley and Kimberly Moore, in footnote 22 of an article in the Boston University Law Review,[17] asserted that Clarke was guilty of "erroneously assuming that every continuation resulted in a patent and concluding that the grant rate was 75%." Because of this assertion, Lemley and Moore concluded "The 85% number provided in the revised Quillen et al. study is based on actual data about the applications that issue based on continuations, and reflects the best estimate we have of how often applications mature into patents."

As pointed out earlier, Clarke made no assumption anywhere in his paper that "every continuation resulted in a patent" and, as such, the footnote is incorrect and not properly cite-checked.

Subsequently, it has been suggested that the footnote intended to state "erroneously assuming every allowed continuation resulted in a patent." This suggestion may be criticized on several grounds.

First, Clarke did not "assume" every allowed continuation resulted in a patent. To eliminate the effects of continuing application practice on the patent grant rate, he identified issued patents claiming priority to an earlier issued patent and he removed them from consideration.[18] This removal included all continuing applications (continuations, divisionals, continuations-in-part).

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common inventors on the same day on similar subject matter, but which are not continuing applications. Note for example Fenn's US patents 4,531,056 and 4,542,293, both filed April 20, 1983.
[16] The inventor Clyde Bryant of US 6,279,550 , cited within both Caterpillar patents, is seeking re-examination of the '280 patent.
[17] Mark A. Lemley and Kimberley L. Moore, Ending Abuse of Patent Continuations, 84 B. U. L. Rev. 63 (2004)
[18] Robert A. Clarke, U.S. Continuity Law and its Impact on the Comparative Patenting Rates of the U.S., Japan, and European Patent Office, 85 J. Pat. & Trademark Off. Soc'y [JPTOS] 335, 338 (2003).
 (The USTPO models, however, also deduct from the total number of patents the percentage of applications that give rise to patents both from the original applications and from continuing applications (which Quillen and Webster does not).)

Second, Clarke did not remove from consideration allowed continuations that did not claim priority to an issued patent and Clarke did not remove from consideration allowed continuations which did not give rise to a patent.

Third, in working with data on issued patents to identify the number of patents based on continuing applications, Clarke merely did a more thorough job of what was attempted in the QWII. As stated in footnote 22 of Lemley and Moore: "The 85% number provided in the revised Quillen et al. study is based on actual data about the applications that ISSUE based on continuations," [emphasis added[19]], QWII made their correction based on data on ISSUED applications, not on ALLOWED applications. If the use of data on ISSUED applications means an assumption that every allowed continuation resulted in a patent, then it is an assumption made by both Quillen/Webster and Clarke. Because it is assumed by both, this assumption is not a basis to select the results of Quillen/Webster over those of Clarke.

Thus, footnote 22, as written, is incorrect, and even as favorably modified is irrelevant to distinguishing the results of Quillen/Webster from those of Clarke.

The error in footnote 22 is problematic, but the failure of author Moore or the Boston University Law Review to respond and to correct the error is particularly troubling. In a different area, in the context of the plagiarism issue involving Professor Laurence Tribe of Harvard Law School,[20] Professor Allan Dershowitz suggested there was a "cultural difference" between sourcing in the legal profession and other academic disciplines.[21] One would hope that there is no cultural between law and other academic disciplines as to the correction of published text which is indisputably wrong.[22]

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[19] In fact, the predicate text in the article by Lemley and Moore is "Recent work by Cecil Quillen and others shows that when continuations are taken into account, the PTO issues patents on over 85% of the application chains that are filed." 84 B.U.L. Rev. at 69.

[20] Timothy Noah, More Harvard Plagiarism. What is it with these Superstar Profs?, Slate, September 28, 2004. http://slate.msn.com/id/2107361/ ;Harvard Crimson, What Academia is Hiding, September 13, 2004. http://www.thecrimson.com/article.aspx?ref=503313

[21] Daniel J. Hemel and Lauren A. E. Shuker, Prof Admits to Misusing Source, Harvard Crimson, September 27, 2004. http://www.thecrimson.com/article.aspx?ref=503493

[22] A different footnote issue (involving the foresight of the inventors of the transistor (Bardeen, Brattain, and Shockley) and of radio (Marconi) in the context of a discussion on foreseeability) is discussed in Lawrence B. Ebert, Foreseeing a Not Obvious Future, Intellectual Property Today, pp. 34-37 (September 2004). [available LEXIS]